FIG. 1

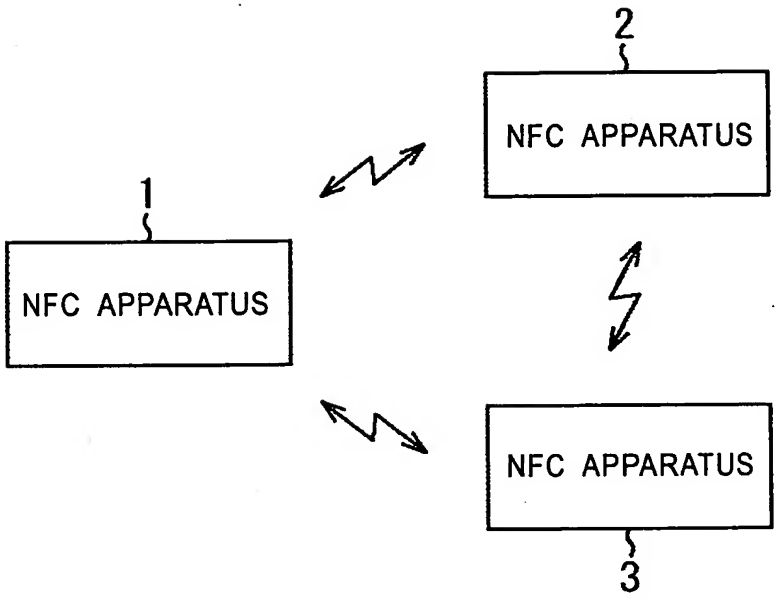


FIG. 2

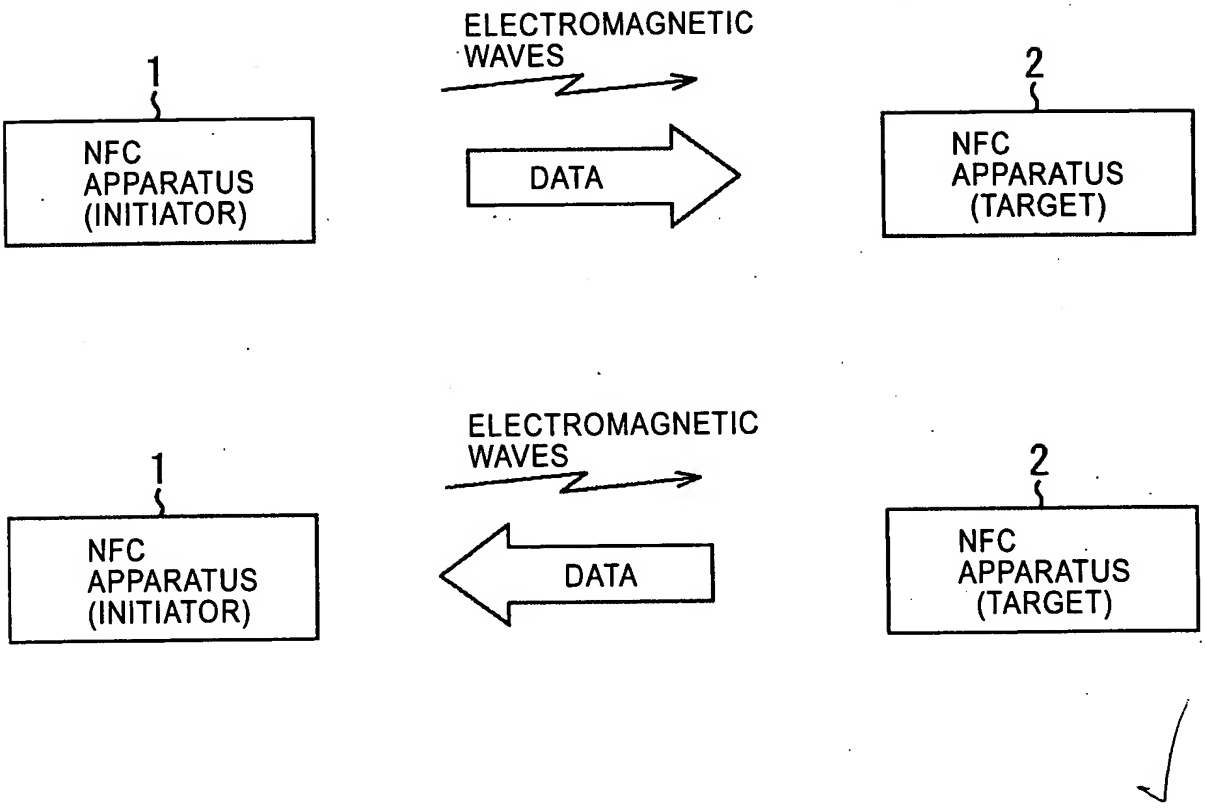

ELECTROMAGNETIC WAVES
1
NFC APPARATUS (INITIATOR)
DATA
2
NFC APPARATUS (TARGET)
ELECTROMAGNETIC WAVES
1
NFC APPARATUS (INITIATOR)
DATA
2
NFC APPARATUS (TARGET)

FIG. 3

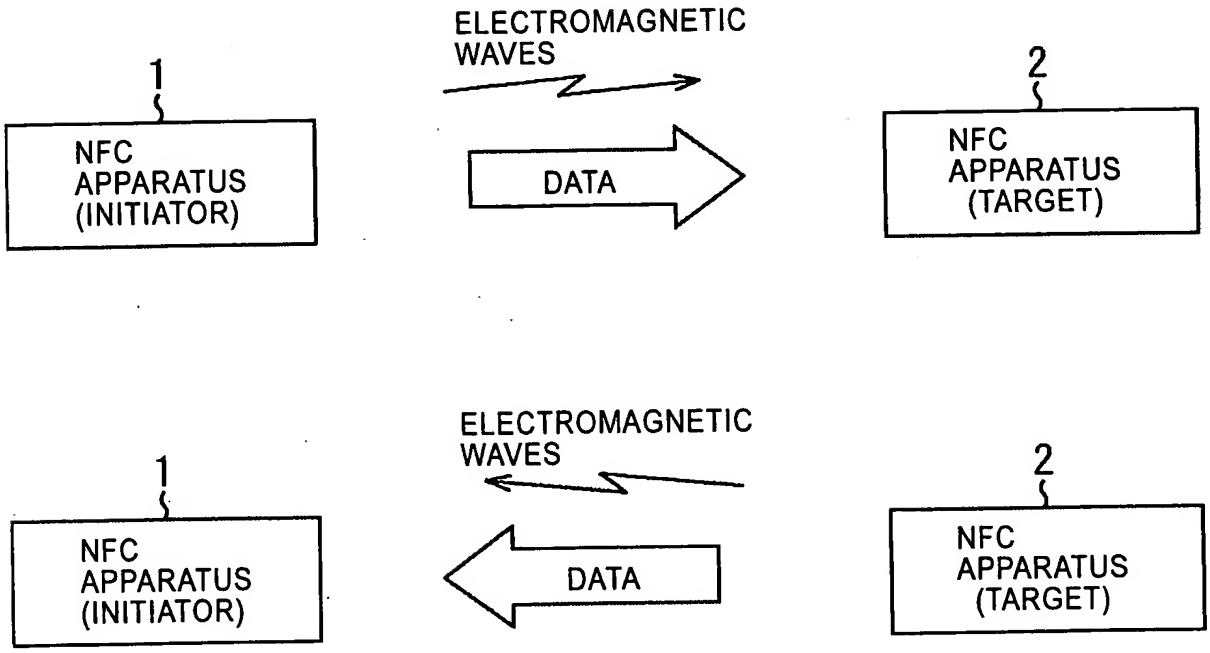

ELECTROMAGNETIC WAVES
1
NFC APPARATUS (INITIATOR)
DATA
2
NFC APPARATUS (TARGET)
ELECTROMAGNETIC WAVES
1
NFC APPARATUS (INITIATOR)
DATA
2
NFC APPARATUS (TARGET)

FIG. 4

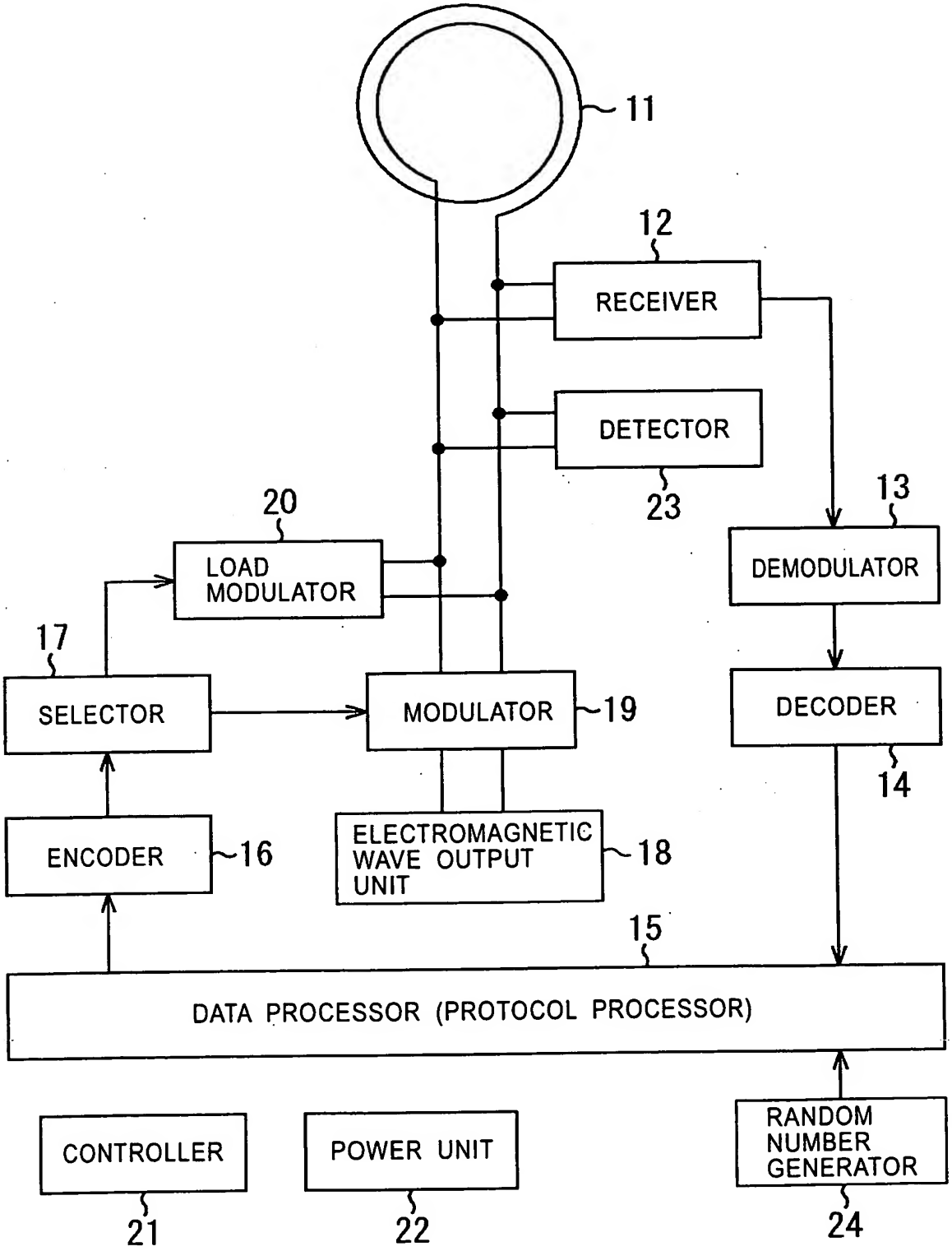

11
12
RECEIVER
DETECTOR
23
20
LOAD MODULATOR
13
DEMODULATOR
17
SELECTOR
MODULATOR
19
DECODER
14
ENCODER
16
ELECTROMAGNETIC WAVE OUTPUT UNIT
18
15
DATA PROCESSOR (PROTOCOL PROCESSOR)
CONTROLLER
21
POWER UNIT
22
RANDOM NUMBER GENERATOR
24

FIG. 5

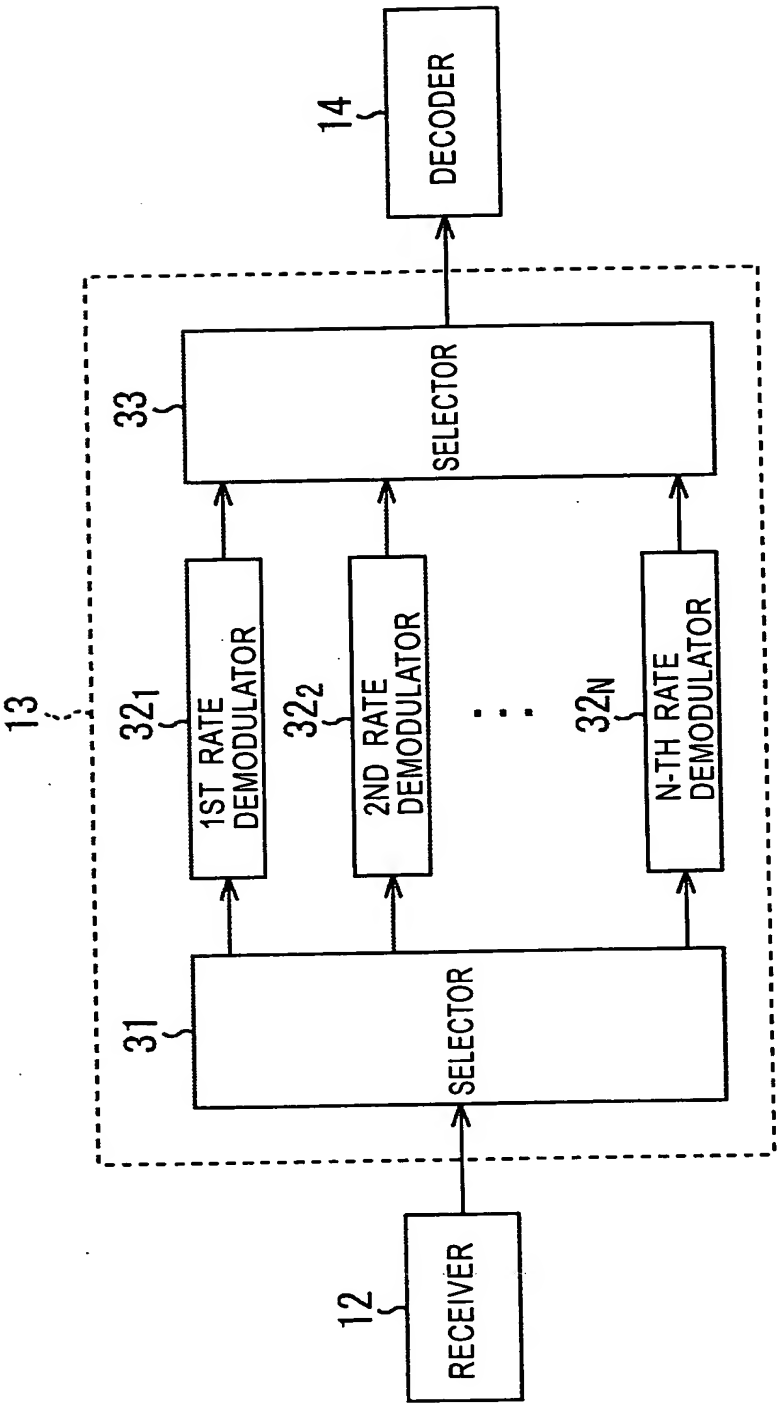

12
RECEIVER
13
31
SELECTOR
32_1
1ST RATE DEMODULATOR
32_2
2ND RATE DEMODULATOR
32_N
N-TH RATE DEMODULATOR
33
SELECTOR
14
DECODER

FIG. 6

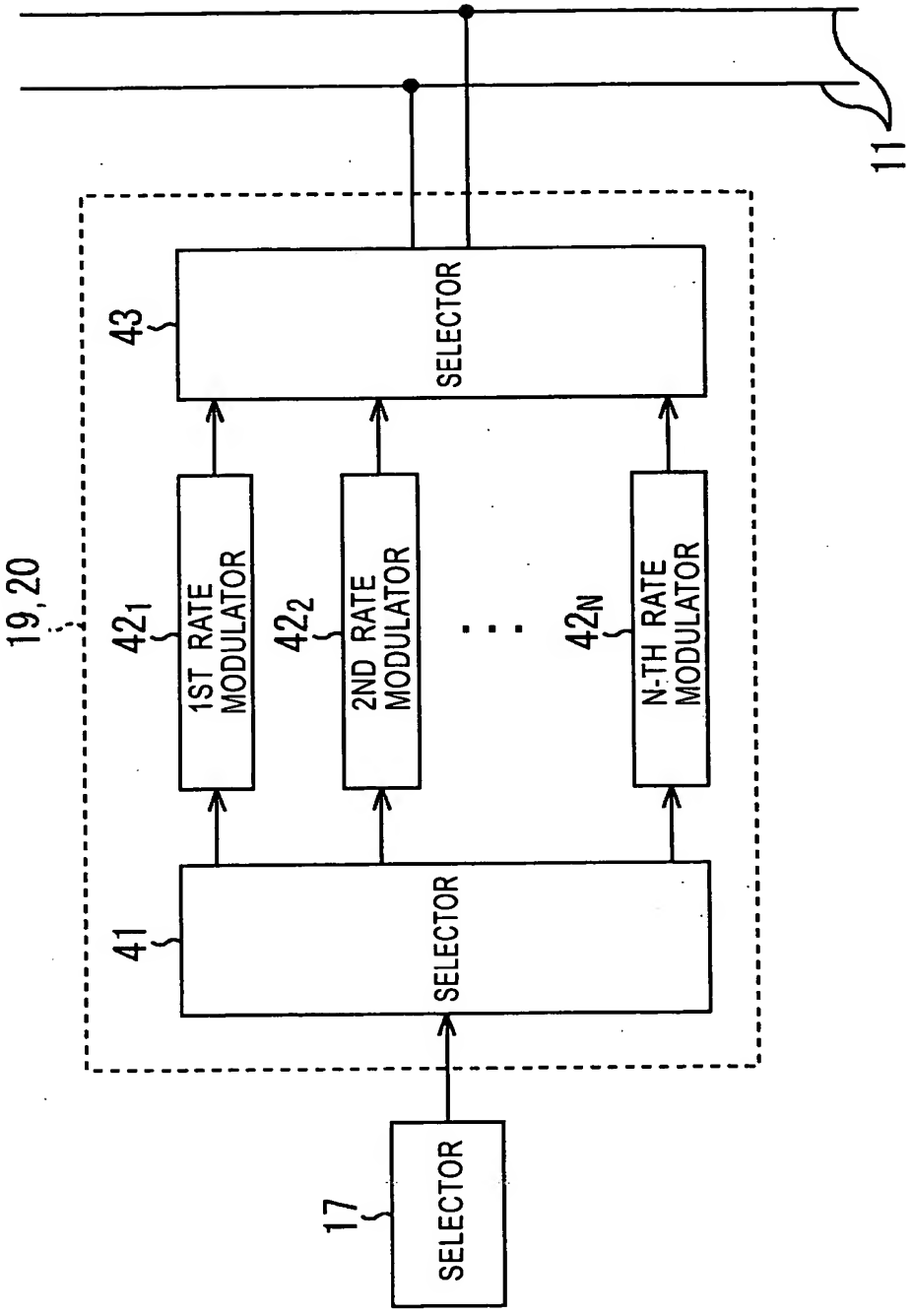

11
19, 20
43
SELECTOR
42₁
1ST RATE MODULATOR
42₂
2ND RATE MODULATOR
42N
N-TH RATE MODULATOR
41
SELECTOR
17
SELECTOR

FIG. 7

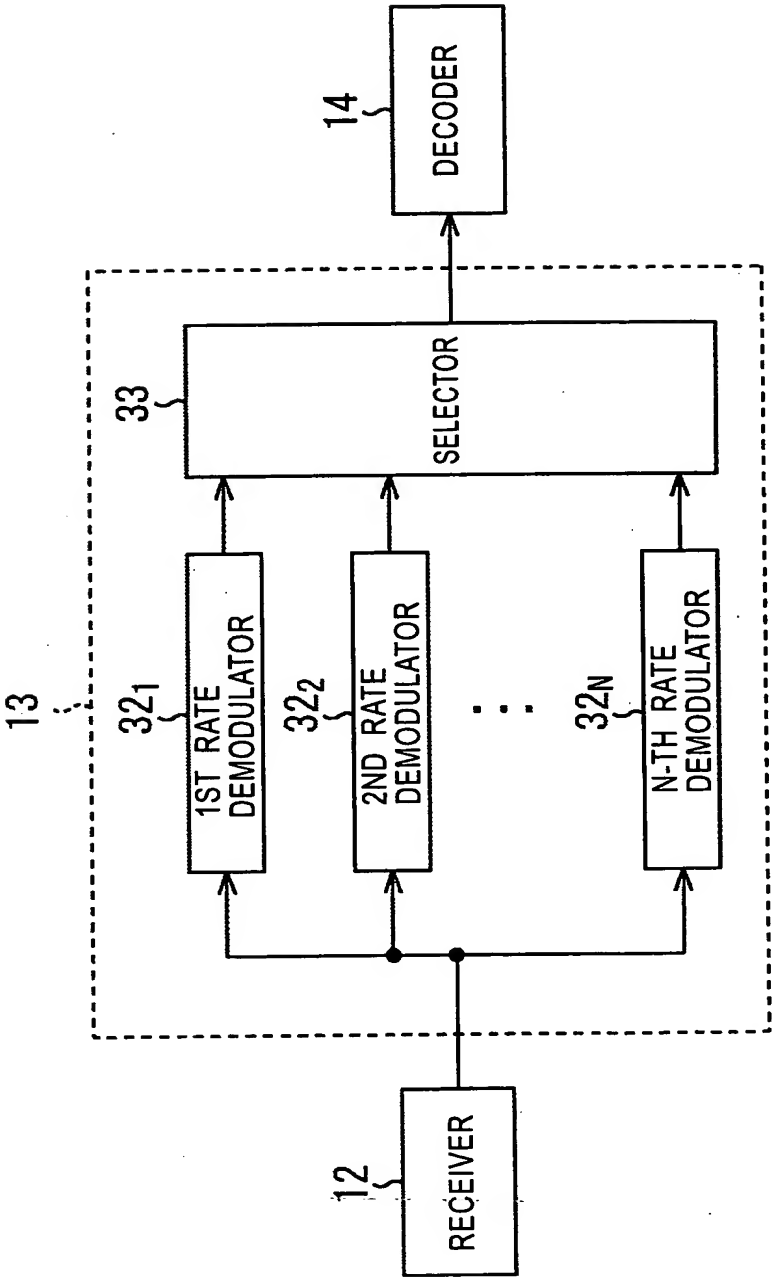

14
DECODER
33
SELECTOR
13
32₁
1ST RATE DEMODULATOR
32₂
2ND RATE DEMODULATOR
32N
N-TH RATE DEMODULATOR
12
RECEIVER

FIG. 8

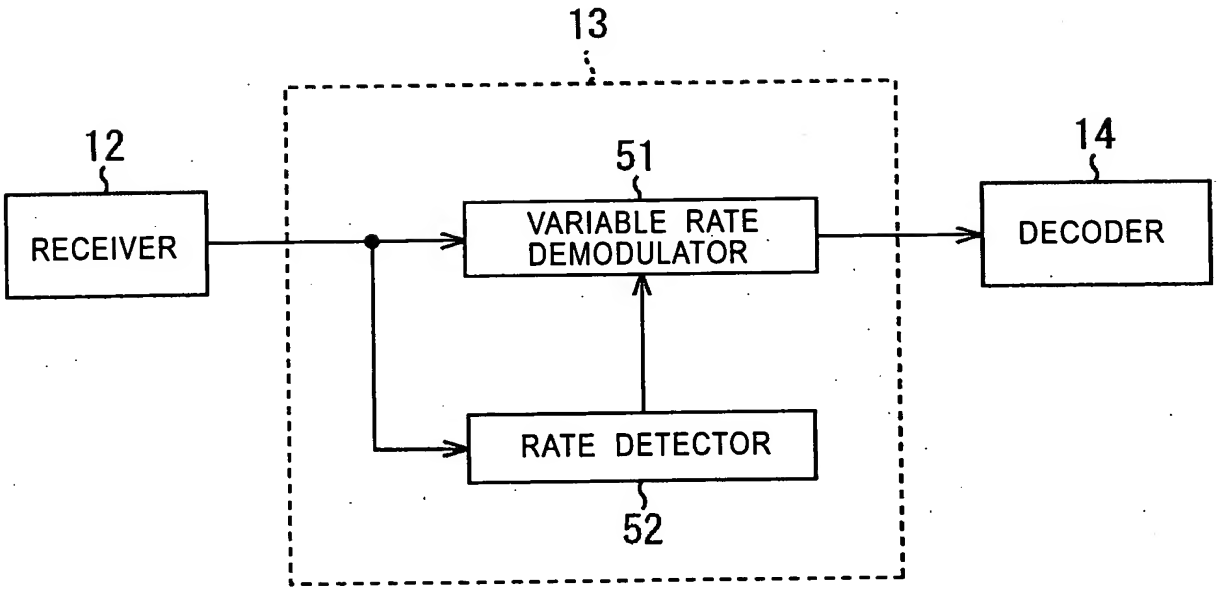
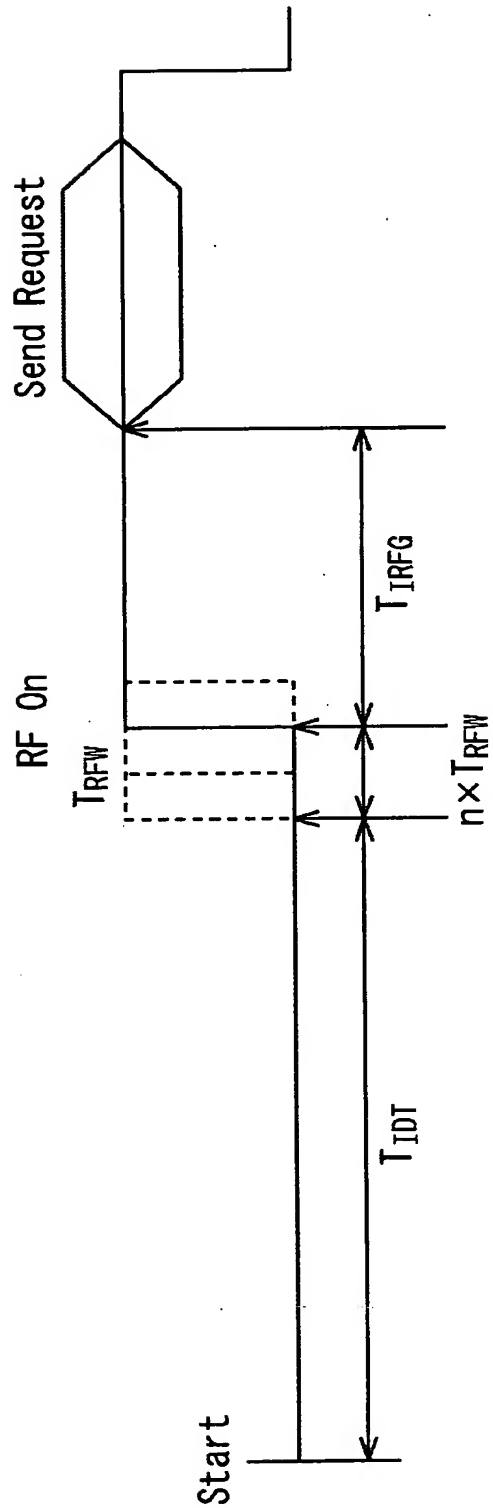

13
12
RECEIVER
51
VARIABLE RATE DEMODULATOR
14
DECODER
RATE DETECTOR
52

FIG. 9



T_{IDT}: Initial delay time. $T_{IDT}>4\ 096/fc$

T_{RFW}: RF waiting time. $512/fc$

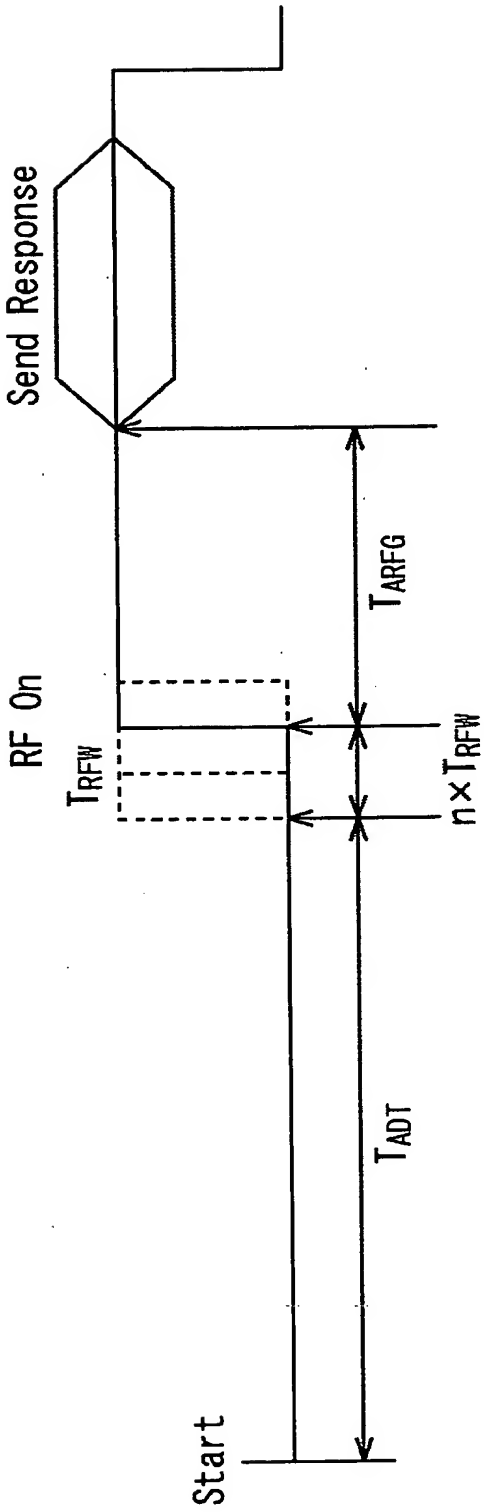
n: randomly generated number of Time Periods for T_{RFW}.

$0 \leq n \leq 3$

T_{IRFG}: Initial guard-time between switching on RF field and start to send command or data frame.

$T_{IRFG}>5$ ms

FIG. 10



T_{ADT}: Active delay time, sense time between RF off Initiator/Target and Target/Initiator.
($768/fc \leq T_{ADT} \leq 2\ 559/fc$)

T_{RFW}: RF waiting time. ($512/fc$)

n: Randomly generated number of Time Periods for T_{RFW}. ($0 \leq n \leq 3$)

T_{ARFG}: Active guard time between switching on RF field and start to send command. ($T_{ARFG} > 1024/fc$)

FIG. 11

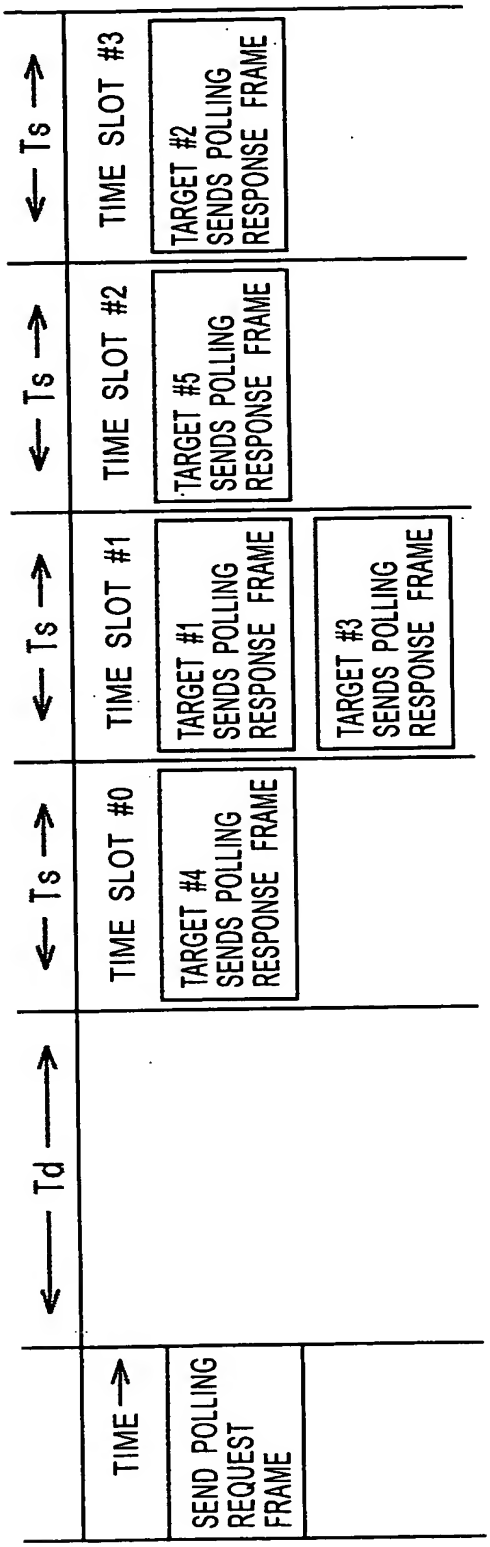

TIME →
SEND POLLING REQUEST FRAME
← Td →
TIME SLOT #0
TARGET #4 SENDS POLLING RESPONSE FRAME
← Ts →
TIME SLOT #1
TARGET #1 SENDS POLLING RESPONSE FRAME
TARGET #3 SENDS POLLING RESPONSE FRAME
← Ts →
TIME SLOT #2
TARGET #5 SENDS POLLING RESPONSE FRAME
← Ts →
TIME SLOT #3
TARGET #2 SENDS POLLING RESPONSE FRAME

FIG. 12

COMMAND/RESPONSE
ATR_REQ
ATR_RES
WUP_REQ
WUP_RES
PSL_REQ
PSL_RES
DEP_REQ
DEP_RES
DSL_REQ
DSL_RES
RLS_REQ
RLS_RES

FIG. 13

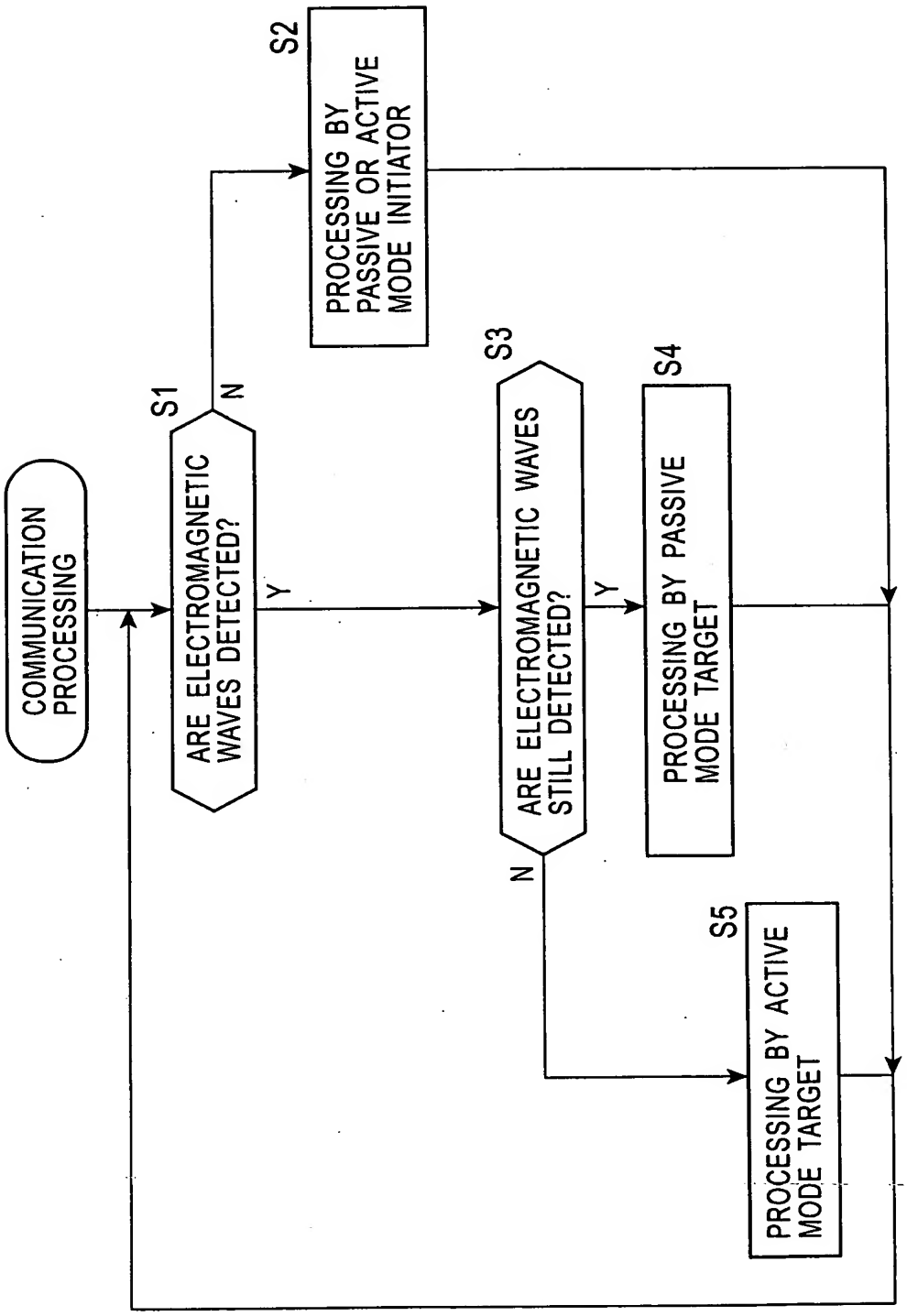

COMMUNICATION PROCESSING
S1
ARE ELECTROMAGNETIC WAVES DETECTED?
N
Y
S2
PROCESSING BY PASSIVE OR ACTIVE MODE INITIATOR
S3
ARE ELECTROMAGNETIC WAVES STILL DETECTED?
Y
N
S4
PROCESSING BY PASSIVE MODE TARGET
S5
PROCESSING BY ACTIVE MODE TARGET

FIG. 14

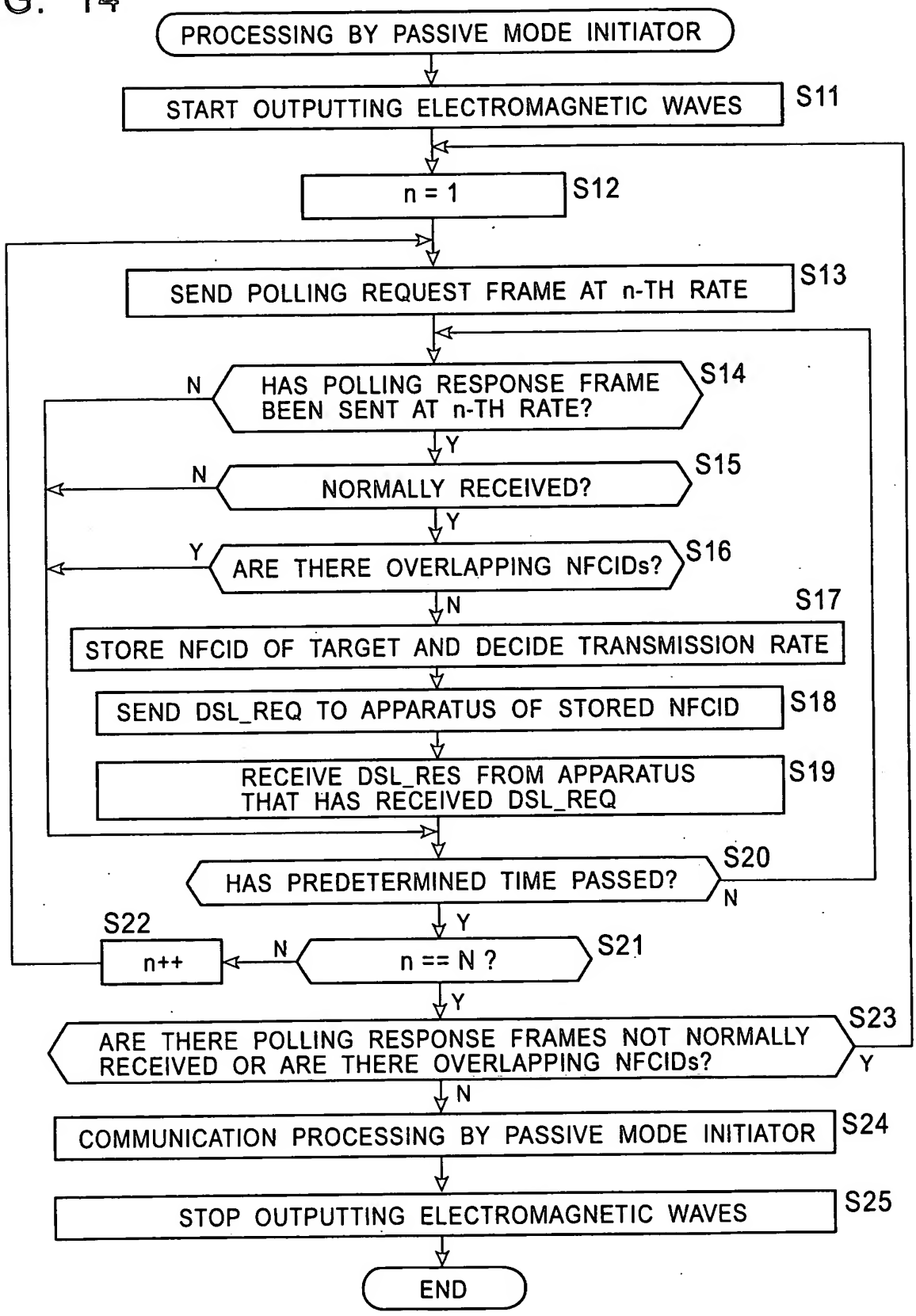

PROCESSING BY PASSIVE MODE INITIATOR
START OUTPUTTING ELECTROMAGNETIC WAVES
S11
n = 1
S12
SEND POLLING REQUEST FRAME AT n-TH RATE
S13
HAS POLLING RESPONSE FRAME BEEN SENT AT n-TH RATE?
S14
N
Y
NORMALLY RECEIVED?
S15
N
Y
ARE THERE OVERLAPPING NFCIDs?
S16
Y
N
S17
STORE NFCID OF TARGET AND DECIDE TRANSMISSION RATE
SEND DSL_REQ TO APPARATUS OF STORED NFCID
S18
RECEIVE DSL_RES FROM APPARATUS THAT HAS RECEIVED DSL_REQ
S19
HAS PREDETERMINED TIME PASSED?
S20
N
Y
n == N ?
S21
N
n++
S22
Y
ARE THERE POLLING RESPONSE FRAMES NOT NORMALLY RECEIVED OR ARE THERE OVERLAPPING NFCIDs?
S23
Y
N
COMMUNICATION PROCESSING BY PASSIVE MODE INITIATOR
S24
STOP OUTPUTTING ELECTROMAGNETIC WAVES
S25
END

FIG. 15

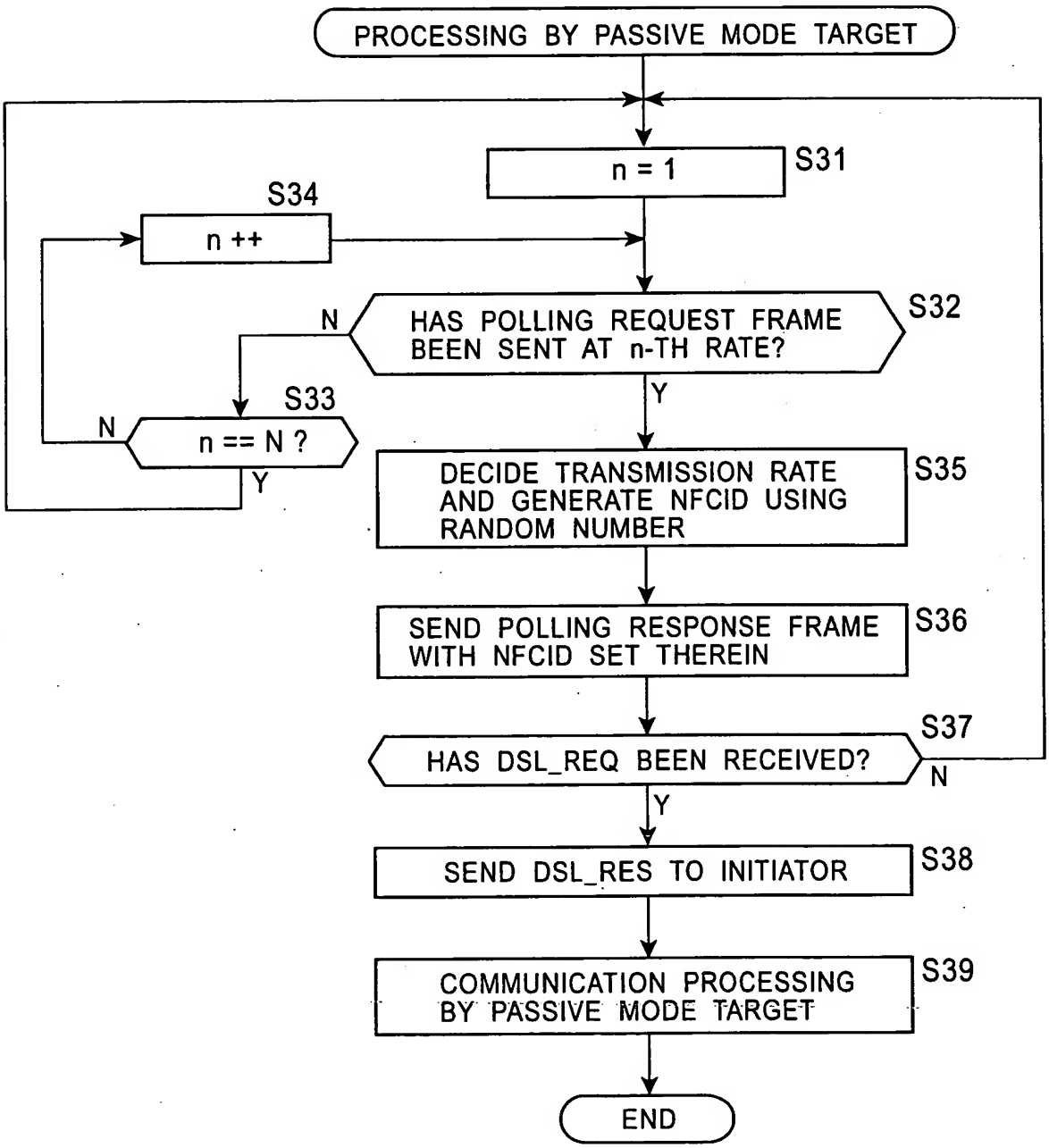

PROCESSING BY PASSIVE MODE TARGET
n = 1
S31
S34
n ++
N
HAS POLLING REQUEST FRAME BEEN SENT AT n-TH RATE?
S32
Y
S33
N
n == N ?
Y
DECIDE TRANSMISSION RATE AND GENERATE NFCID USING RANDOM NUMBER
S35
SEND POLLING RESPONSE FRAME WITH NFCID SET THEREIN
S36
S37
HAS DSL_REQ BEEN RECEIVED?
N
Y
SEND DSL_RES TO INITIATOR
S38
COMMUNICATION PROCESSING BY PASSIVE MODE TARGET
S39
END

FIG. 16

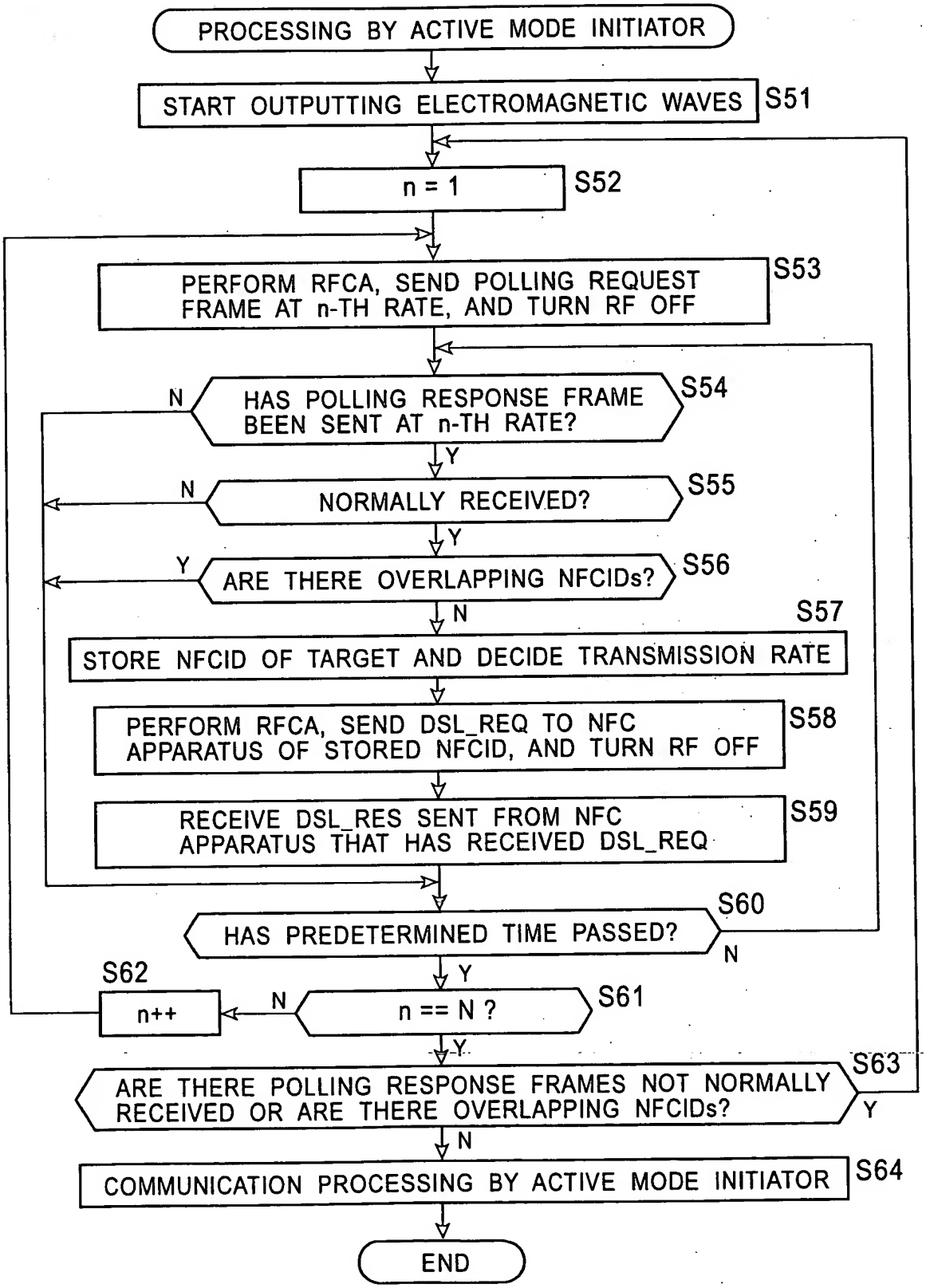

PROCESSING BY ACTIVE MODE INITIATOR
START OUTPUTTING ELECTROMAGNETIC WAVES
S51
n = 1
S52
PERFORM RFCA, SEND POLLING REQUEST FRAME AT n-TH RATE, AND TURN RF OFF
S53
HAS POLLING RESPONSE FRAME BEEN SENT AT n-TH RATE?
S54
N
Y
NORMALLY RECEIVED?
S55
N
Y
ARE THERE OVERLAPPING NFCIDs?
S56
Y
N
STORE NFCID OF TARGET AND DECIDE TRANSMISSION RATE
S57
PERFORM RFCA, SEND DSL_REQ TO NFC APPARATUS OF STORED NFCID, AND TURN RF OFF
S58
RECEIVE DSL_RES SENT FROM NFC APPARATUS THAT HAS RECEIVED DSL_REQ
S59
HAS PREDETERMINED TIME PASSED?
S60
N
Y
n == N ?
S61
N
n++
S62
Y
ARE THERE POLLING RESPONSE FRAMES NOT NORMALLY RECEIVED OR ARE THERE OVERLAPPING NFCIDs?
S63
Y
N
COMMUNICATION PROCESSING BY ACTIVE MODE INITIATOR
S64
END

FIG. 17

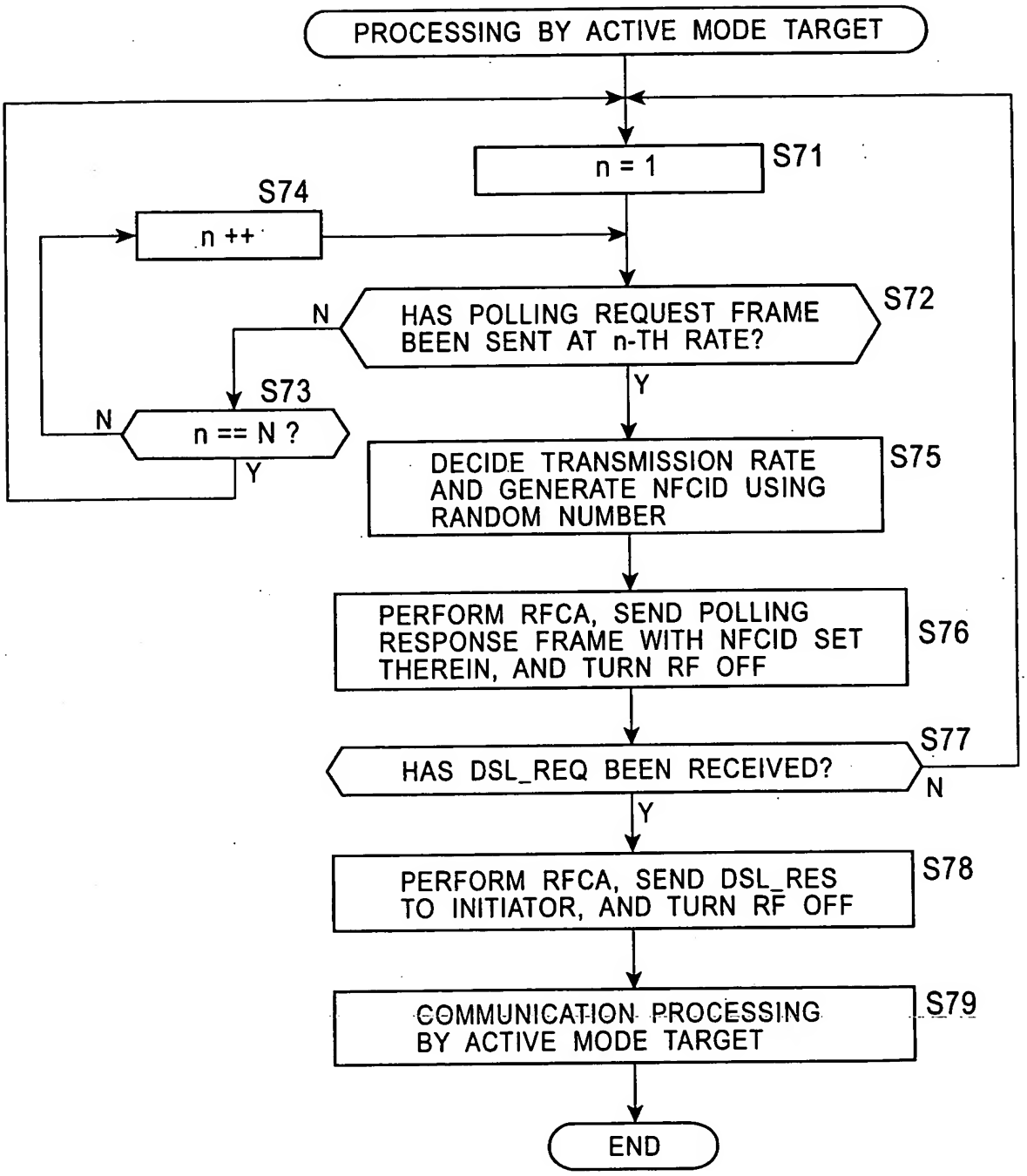

PROCESSING BY ACTIVE MODE TARGET
n = 1
S71
S74
n ++
N
HAS POLLING REQUEST FRAME BEEN SENT AT n-TH RATE?
S72
S73
N
n == N ?
Y
Y
DECIDE TRANSMISSION RATE AND GENERATE NFCID USING RANDOM NUMBER
S75
PERFORM RFCA, SEND POLLING RESPONSE FRAME WITH NFCID SET THEREIN, AND TURN RF OFF
S76
S77
HAS DSL_REQ BEEN RECEIVED?
N
Y
PERFORM RFCA, SEND DSL_RES TO INITIATOR, AND TURN RF OFF
S78
COMMUNICATION PROCESSING BY ACTIVE MODE TARGET
S79
END

FIG. 18

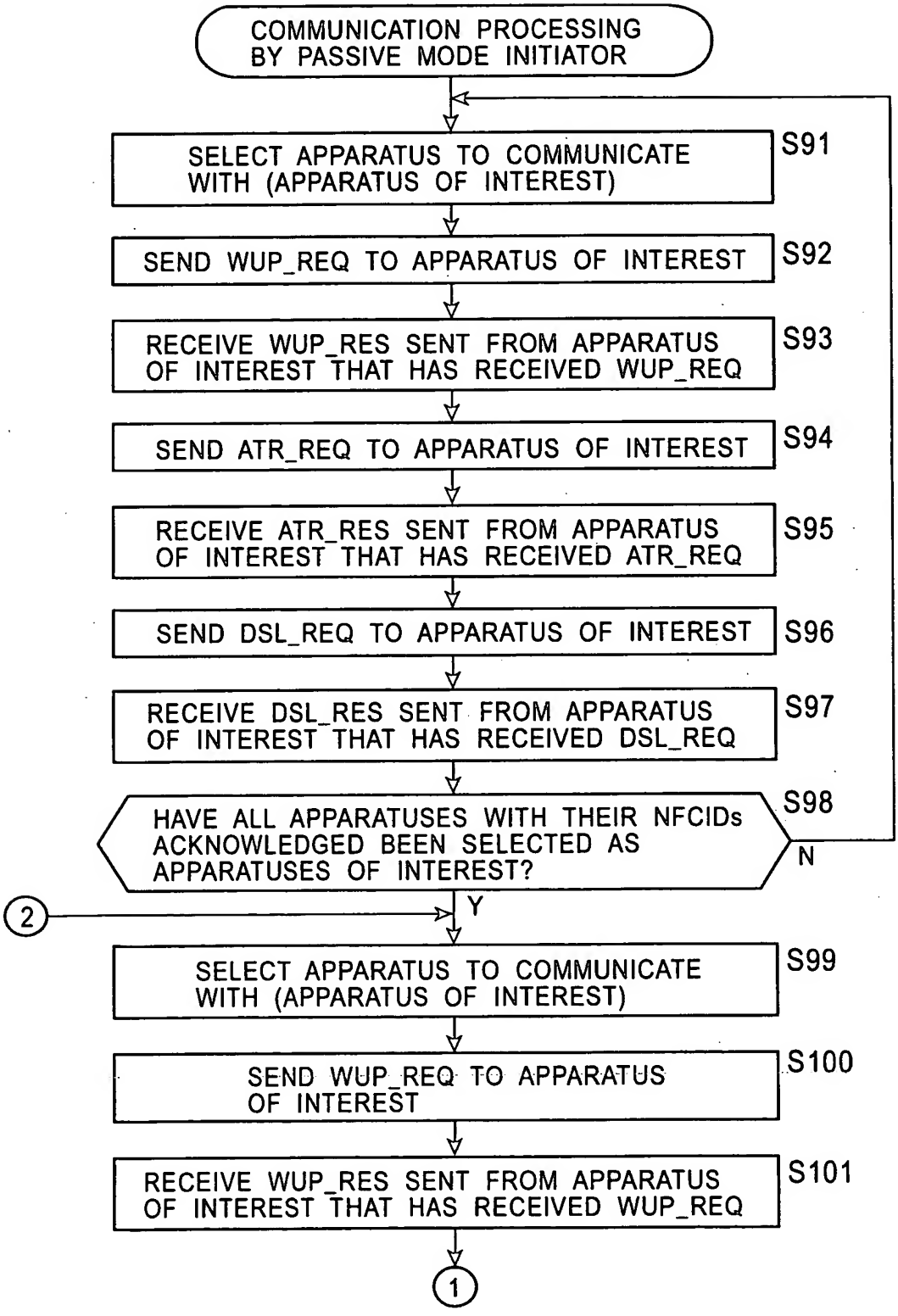

COMMUNICATION PROCESSING BY PASSIVE MODE INITIATOR
SELECT APPARATUS TO COMMUNICATE WITH (APPARATUS OF INTEREST)
S91
SEND WUP_REQ TO APPARATUS OF INTEREST
S92
RECEIVE WUP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED WUP_REQ
S93
SEND ATR_REQ TO APPARATUS OF INTEREST
S94
RECEIVE ATR_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED ATR_REQ
S95
SEND DSL_REQ TO APPARATUS OF INTEREST
S96
RECEIVE DSL_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DSL_REQ
S97
HAVE ALL APPARATUSES WITH THEIR NFCIDs ACKNOWLEDGED BEEN SELECTED AS APPARATUSES OF INTEREST?
S98
N
Y
2
SELECT APPARATUS TO COMMUNICATE WITH (APPARATUS OF INTEREST)
S99
SEND WUP_REQ TO APPARATUS OF INTEREST
S100
RECEIVE WUP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED WUP_REQ
S101
1

FIG. 19

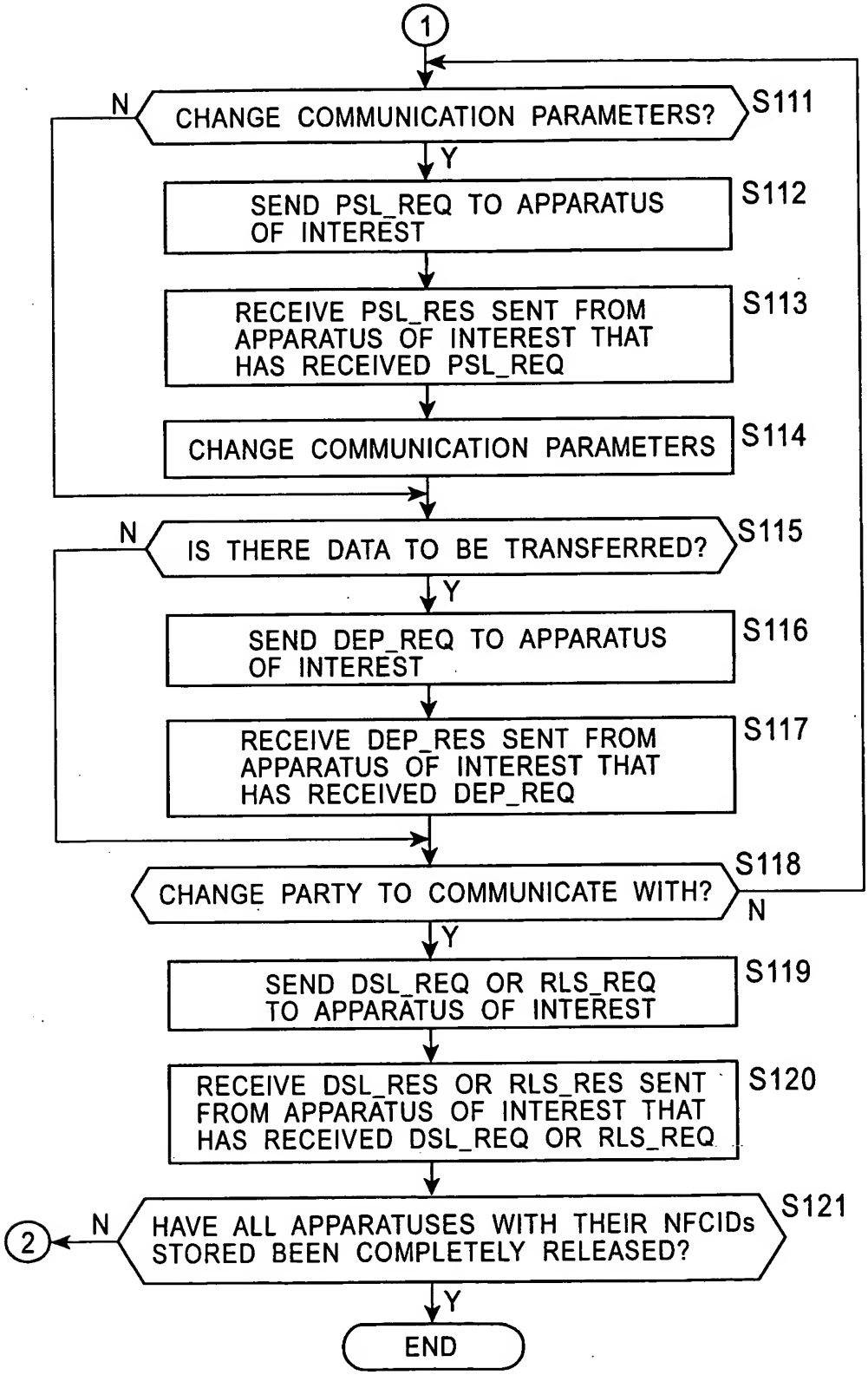

1
CHANGE COMMUNICATION PARAMETERS?
S111
N
Y
SEND PSL_REQ TO APPARATUS OF INTEREST
S112
RECEIVE PSL_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED PSL_REQ
S113
CHANGE COMMUNICATION PARAMETERS
S114
IS THERE DATA TO BE TRANSFERRED?
S115
N
Y
SEND DEP_REQ TO APPARATUS OF INTEREST
S116
RECEIVE DEP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DEP_REQ
S117
CHANGE PARTY TO COMMUNICATE WITH?
S118
N
Y
SEND DSL_REQ OR RLS_REQ TO APPARATUS OF INTEREST
S119
RECEIVE DSL_RES OR RLS_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DSL_REQ OR RLS_REQ
S120
HAVE ALL APPARATUSES WITH THEIR NFCIDs STORED BEEN COMPLETELY RELEASED?
S121
N
2
Y
END

FIG. 20

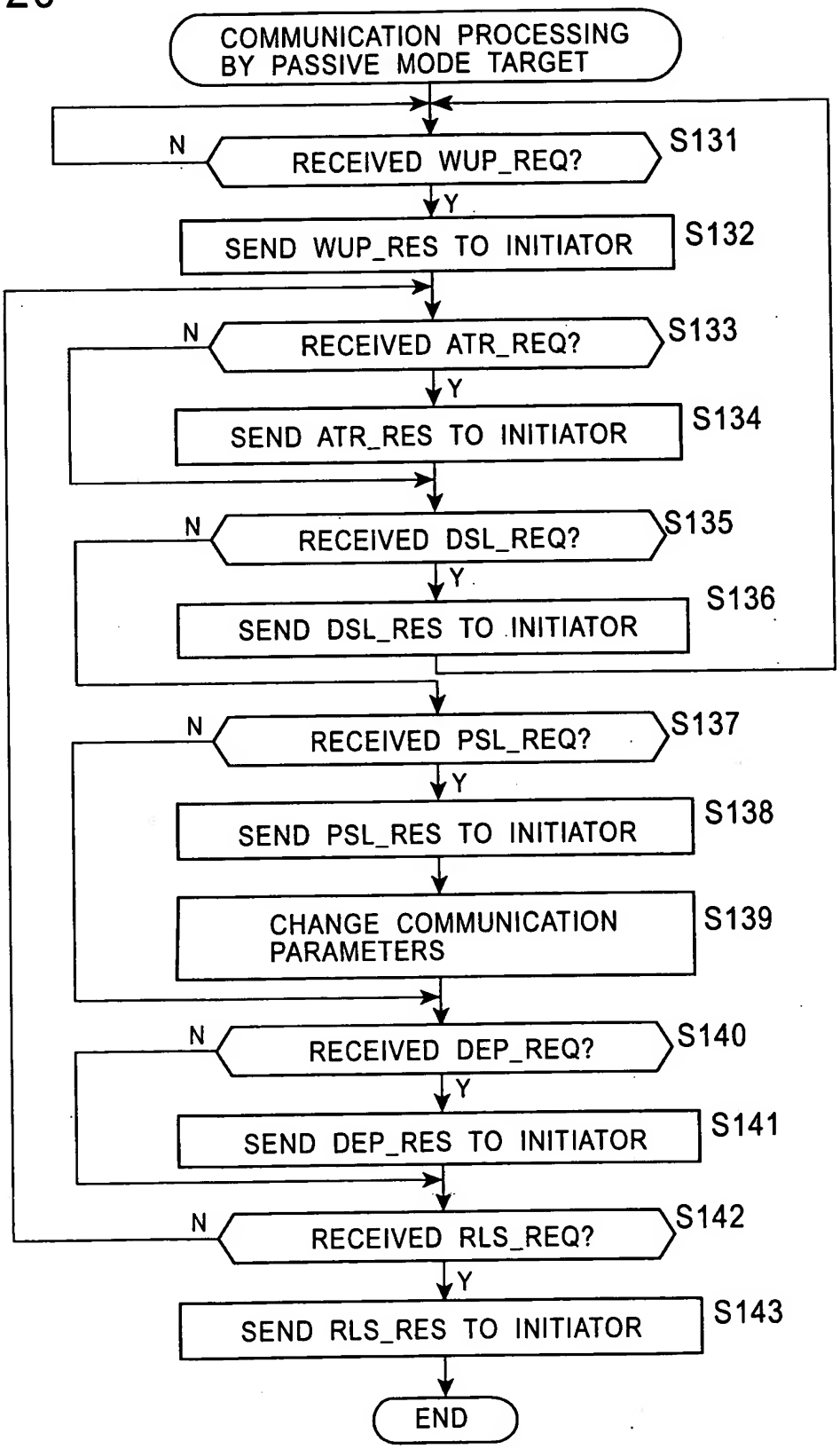

COMMUNICATION PROCESSING BY PASSIVE MODE TARGET
N
RECEIVED WUP_REQ?
S131
Y
SEND WUP_RES TO INITIATOR
S132
N
RECEIVED ATR_REQ?
S133
Y
SEND ATR_RES TO INITIATOR
S134
N
RECEIVED DSL_REQ?
S135
Y
SEND DSL_RES TO INITIATOR
S136
N
RECEIVED PSL_REQ?
S137
Y
SEND PSL_RES TO INITIATOR
S138
CHANGE COMMUNICATION PARAMETERS
S139
N
RECEIVED DEP_REQ?
S140
Y
SEND DEP_RES TO INITIATOR
S141
N
RECEIVED RLS_REQ?
S142
Y
SEND RLS_RES TO INITIATOR
S143
END

FIG. 21

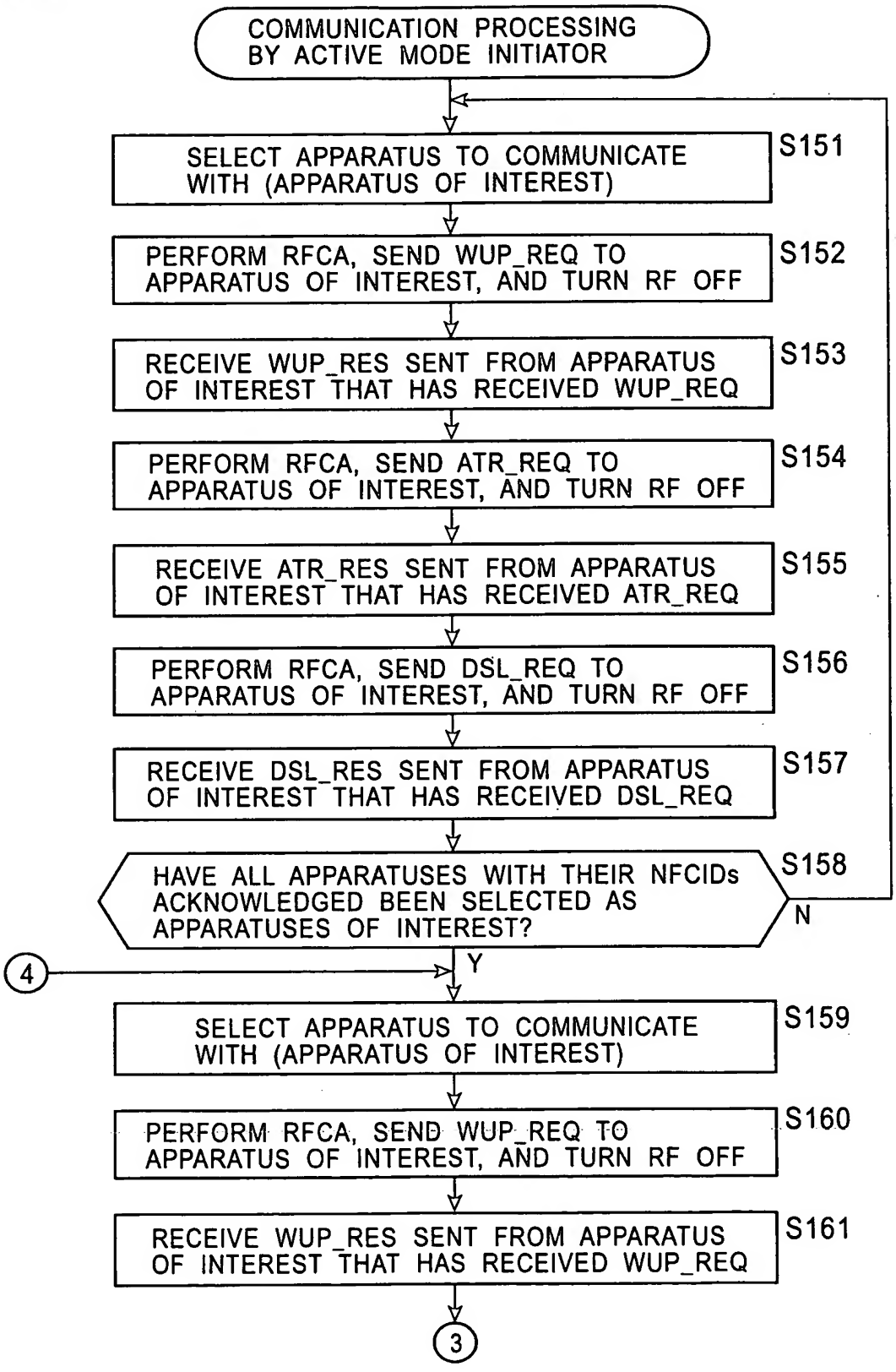

COMMUNICATION PROCESSING BY ACTIVE MODE INITIATOR
SELECT APPARATUS TO COMMUNICATE WITH (APPARATUS OF INTEREST)
S151
PERFORM RFCA, SEND WUP_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S152
RECEIVE WUP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED WUP_REQ
S153
PERFORM RFCA, SEND ATR_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S154
RECEIVE ATR_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED ATR_REQ
S155
PERFORM RFCA, SEND DSL_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S156
RECEIVE DSL_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DSL_REQ
S157
HAVE ALL APPARATUSES WITH THEIR NFCIDs ACKNOWLEDGED BEEN SELECTED AS APPARATUSES OF INTEREST?
S158
N
Y
4
SELECT APPARATUS TO COMMUNICATE WITH (APPARATUS OF INTEREST)
S159
PERFORM RFCA, SEND WUP_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S160
RECEIVE WUP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED WUP_REQ
S161
3

FIG. 22

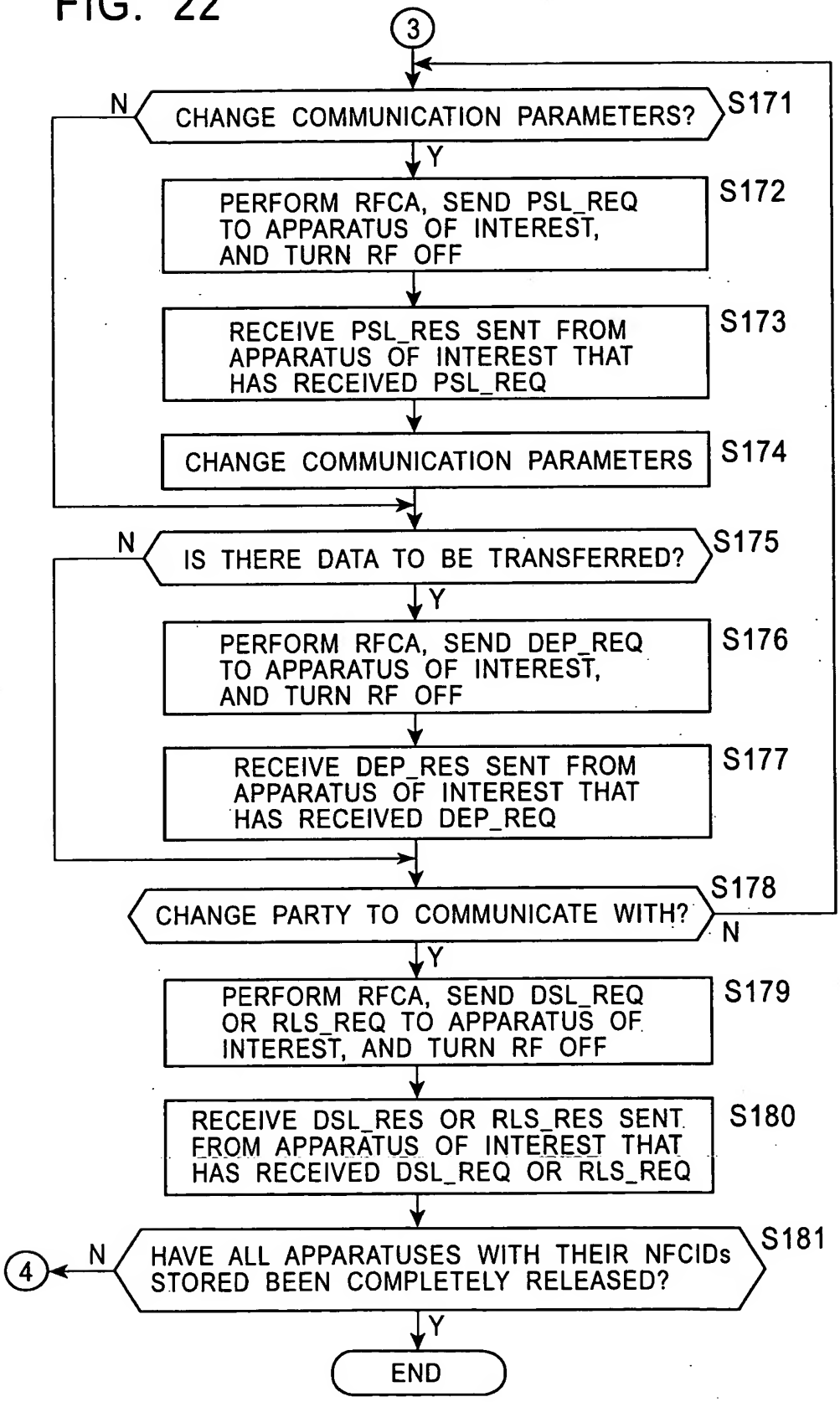
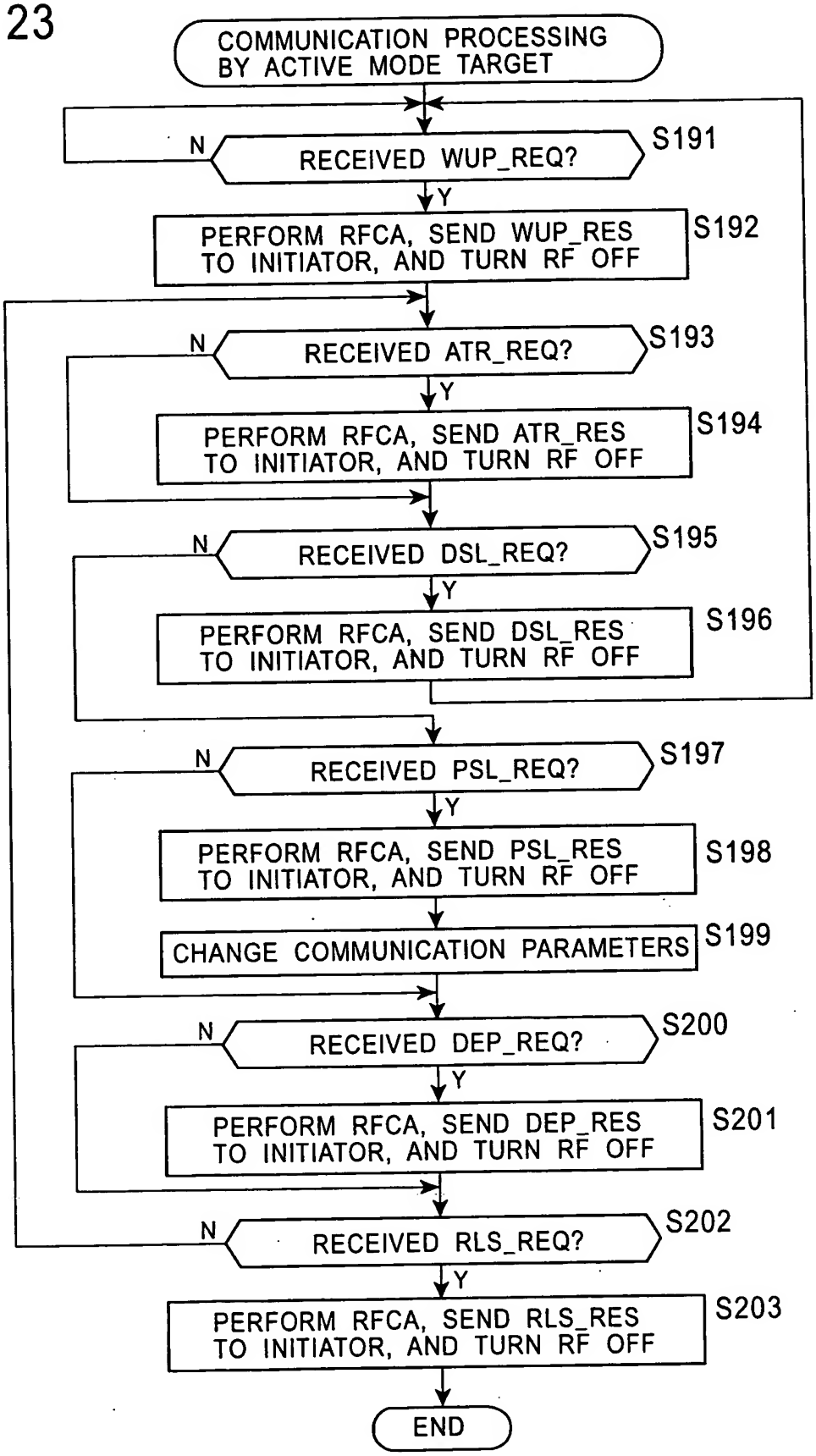

3
CHANGE COMMUNICATION PARAMETERS?
S171
N
Y
PERFORM RFCA, SEND PSL_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S172
RECEIVE PSL_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED PSL_REQ
S173
CHANGE COMMUNICATION PARAMETERS
S174
IS THERE DATA TO BE TRANSFERRED?
S175
N
Y
PERFORM RFCA, SEND DEP_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S176
RECEIVE DEP_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DEP_REQ
S177
CHANGE PARTY TO COMMUNICATE WITH?
S178
N
Y
PERFORM RFCA, SEND DSL_REQ OR RLS_REQ TO APPARATUS OF INTEREST, AND TURN RF OFF
S179
RECEIVE DSL_RES OR RLS_RES SENT FROM APPARATUS OF INTEREST THAT HAS RECEIVED DSL_REQ OR RLS_REQ
S180
HAVE ALL APPARATUSES WITH THEIR NFCIDs STORED BEEN COMPLETELY RELEASED?
S181
N
4
Y
END

FIG. 23


COMMUNICATION PROCESSING BY ACTIVE MODE TARGET
N
RECEIVED WUP_REQ?
S191
Y
PERFORM RFCA, SEND WUP_RES TO INITIATOR, AND TURN RF OFF
S192
N
RECEIVED ATR_REQ?
S193
Y
PERFORM RFCA, SEND ATR_RES TO INITIATOR, AND TURN RF OFF
S194
N
RECEIVED DSL_REQ?
S195
Y
PERFORM RFCA, SEND DSL_RES TO INITIATOR, AND TURN RF OFF
S196
N
RECEIVED PSL_REQ?
S197
Y
PERFORM RFCA, SEND PSL_RES TO INITIATOR, AND TURN RF OFF
S198
CHANGE COMMUNICATION PARAMETERS
S199
N
RECEIVED DEP_REQ?
S200
Y
PERFORM RFCA, SEND DEP_RES TO INITIATOR, AND TURN RF OFF
S201
N
RECEIVED RLS_REQ?
S202
Y
PERFORM RFCA, SEND RLS_RES TO INITIATOR, AND TURN RF OFF
S203
END